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APPENDIX C.5

DERIVATION OF ALLOWABLE DAILY INTAKE

Sodium

The recommended intake of sodium is 2,300 mg/day, according to some authorities (Luft, 1990). This number was rounded to 2,000 and divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were then done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 200 \text{ mg/day}$$

$$X = 100 \text{ mg/l } (100{,}000 \text{ µg/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6\text{mg} = 200 \text{ mg/day}$$

$$X = 1{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6\text{mg} = 200 \text{ mg/day}$$

$$X = 12{,}500 \text{ mg/kg fish}$$

Calcium

The recommended daily allowance of calcium is 800 mg/day for adults (NRC, 1989). This number was selected as acceptable and back calculations done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 800 \text{ mg/day}$$

$$X = 400 \text{ mg/l } (400{,}000 \text{ µg/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 800 \text{ mg/day}$$

$$X = 4{,}000{,}000 \text{ mg/kg soil } (1{,}000{,}000 \textit{ mg/kg used})$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 800 \text{ mg/day}$$

$$X = 50{,}000 \text{ mg/kg fish}$$

Magnesium

Average daily magnesium intake in the United States reportedly ranges from 230 to 310 mg/kg (Shils, 1990). Therefore, 230 mg/kg was chosen as the acceptable level and that number divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$\frac{X \text{ mg/l} * 2 \text{ l/day}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 805 \text{ mg/l } (805{,}000 \text{ µg/l})$$

Soil:

$$\frac{X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 8{,}050{,}000 \text{ mg/kg soil } (1{,}000{,}000 \textit{ mg/kg used})$$

Fish:

$$\frac{X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg}}{70 \text{ kg}} = 23 \text{ mg/kg/day}$$

$$X = 100{,}630 \text{ mg/kg fish}$$

Potassium

The NRC has determined that the estimated adequate and safe intake level for potassium is between 1,875 and 5,600 mg/day (NRC, 1989). However, acute poisoning in children has been observed at levels as low as 2,000 mg/day (NRC, 1980). Therefore, 2,000 mg/day was chosen as the acceptable level and that number divided by 10 to insure to add a ten-fold measure of safety since no official RDA was available. Back calculations were done as follows to determine acceptable daily intakes in water, soil, and fish, using 2 l/day as the ingestion rate of water, 200 mg/kg as the soil ingestion rate (for a child) (USEPA, 1989), and 16 g/day as the fish consumption rate (for a child) (USEPA, 1994).

Water:

$$X \text{ mg/l} * 2 \text{ l/day} = 200 \text{ mg/day}$$

$$X = 100 \text{ mg/l } (100{,}000 \text{ } \mu\text{g/l})$$

Soil:

$$X \text{ mg/kg} * 200 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 200 \text{ mg/day}$$

$$X = 1{,}000{,}000 \text{ mg/kg soil}$$

Fish:

$$X \text{ mg/kg} * 16{,}000 \text{ mg/day} * \text{kg}/10^6 \text{ mg} = 200 \text{ mg/day}$$

$$X = 12{,}500 \text{ mg/kg fish}$$

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